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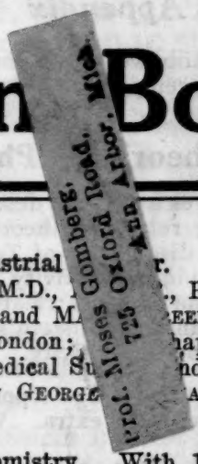

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THE BIOLOGICAL STATION AT FAIRPORT, IOWA, AS AN AGENCY FOR PUBLIC SERVICE[1]

THE U. S. Fisheries Biological Station at Fairport, Iowa, combines in a somewhat unique way the functions of a fisheries biological station and a fish-cultural experiment station. Its functions include the propagation and investigation of fresh-water mussels, the conduct of fish-cultural experiment work, investigation of various fresh-water fishery problems, and the promotion both of a fuller utilization of aquatic products and of a broader and more efficient interest in the protection of aquatic resources. With its admirable building, its extensive equipment of ponds and its general environment, it offers unusually favorable conditions for all manner of biological investigations, and the Bureau of Fisheries invites university biologists to avail themselves of the opportunities there afforded for independent research work.

The primary functions of the station are characteristically ecological. In mussel propagation it deals directly with that striking symbiotic relation existing between fish and mussels, the fish being essential to the development of mussels and the mussels promoting, in part directly, and perhaps in greater part indirectly, the food supply of fishes. As a fish-cultural experiment station, it is concerned not so much with fish as with that complex association of fish, insects, molluscs, crustacea, algæ, and other animals and plants, all of which are intimately interrelated and in turn dependent upon physical and chemical conditions of water, bottom soil and land environment—an association which we call in

[1] The functions and opportunities of the Station as expressed by leaders in the dedicatory exercises and conference held at Fairport, Iowa, in October, 1920, are given in this paper, in connection with an account of the exercises and the conference.

more concise and familiar language, a "fish pond."

Nothing so attests public faith in the possibilities of service by a fisheries biological station as the dedicatory exercises and conference held at Fairport on October 7 and 8, 1920. The occasion was marked as one of unusual significance by the attendance of prominent scientists, the representation of leading universities, the collaboration of men prominent in public life, and the hearty cooperation of business men, some of whom came from cities remote from Fairport.

The universities, colleges and scientific institutions represented were the following, in alphabetical order: Cornell College (Iowa), Cornell University (New York), Davenport Academy of Sciences, Doane College (Nebraska), Harvard University, Iowa State College of Agriculture and Mechanical Arts, Iowa State Teachers College, Johns Hopkins University, Leland Stanford Jr. University, Marine Biological Laboratory (Woods Hole, Mass.), Massachusetts Institute of Technology, Massachusetts State Normal School (Westfield), Northwestern University, Purdue University, University of Chicago, University of Florida, University of Illinois, University of Indiana, University of Iowa, University of Michigan, University of Missouri, University of Oklahoma, University of Wisconsin and Yale University.

The morning and afternoon sessions on October 7, were devoted primarily to the industrial and scientific phases, respectively, of the station's functions. All of the addresses were of sufficient general interest to merit printing in full but this unfortunately has proved impracticable. In the following paragraphs each address is represented by abstracts or extracts of such passages as bear most directly upon the significance and functions of a fisheries biological station.

The ceremonies of dedication were presided over by the Hon. Albert F. Dawson, President of the First National Bank of Muscatine, Iowa, formerly member of Congress, who spoke briefly and instructively of the origin of the station.

In presentation of the building to the Department of Commerce on behalf of the public, Professor James M. White, architect of the building, spoke of the value of a pleasing environment to the prosecution of scientific studies, of the contribution of science to the development of architectural forms, and of the possible value of a new sympathy between the architect and the scientist.

The building was received on behalf of the Department of Commerce by the Hon. Edwin F. Sweet, Assistant Secretary of Commerce, who presented a brief address under the title of "Federal and State Responsibilities for Maintaining the Resources of Interstate Waters." Mr. Sweet strongly expressed as a personal view, not that of the Bureau of Fisheries, his belief that the states might advantageously transfer to the federal government the control of fisheries, not only because of the difficulties attending state control in boundary waters, but also because of the lesser influence of local politics in affairs of national administration. He concluded by formally delivering the building to the Bureau of Fisheries.

In a short speech of acceptance Dr. Hugh M. Smith, Commissioner of Fisheries, spoke of the building as an outward sign of a need, an opportunity and an obligation to strive for the accomplishment of great good in behalf of industry. He emphasized the functions of the station in experimental work for the advancement of fish culture, in investigation of fresh-water biological and fishery problems, in promotion of a fuller utilization of the resources of interior waters and in efforts to awaken broader interest in the preservation of useful aquatic animals so that many future generations may partake of nature's bounties as we are privileged to do.

The program of the morning session included an address by Hon. Charles Nagel, Vice-president of the United States Chamber of Commerce and formerly Secretary of Commerce, who had accepted the invitation in terms of unusual cordiality. Mr. Nagel was prevented from attending only by unexpected

engagements arising at the last moment. A congratulatory letter from Hon. William C. Redfield, formerly Secretary of Commerce, was read by Mr. R. L. Barney, director of the station.

This session concluded with an address by Hon. Harry E. Hull, M.C., under the title of "The Significance of the Station to Industries." He discussed the history of the pearl mussel industry, pointed to the service of science in directing measures of conservation and emphasized the national significance of the work of the station.

As the exercises of the morning stressed the industrial relations of the station, so those of the afternoon gave special emphasis to the scientific phases of its activities. The primary address of the afternoon session was by President Edward A. Birge, of the University of Wisconsin, and was entitled "Aquiculture and Science." President Birge congratulated the bureau on the completion of so admirable a building, which he welcomed "not merely for what it is, but even more on account of the promise for the future which is made by its establishment." He had found, he said, that the term "aquiculture" was regarded by some as a peculiarly technical or "high-brow" word though its twin word "agriculture" was looked upon by no one as in any way extraordinary. He compared and contrasted the well-developed science of agriculture (cultivation of plants and animals upon land) with the unfamiliar and largely undeveloped science of aquiculture (cultivation of plants and animals in water). The following quotations from his address are significant.[1]

> Now the lake is an organism in the same sense that the soil is one. The fish or the clam is not a thing which grows for itself—and for us—alone in a certain environment. It is an integral part of a complex life, a life regulated by chemical substances set free by its manifold operations. These substances stimulate one kind of growth or activity and check another one; and the utilizable crop of fish or of clam shells comes as only one expression of this complex life, as a sort of by-product of all this intricate activity.
>
> So much as this we know, and we know also that all assured progress in aquiculture depends on our knowledge of this complex life. We must see the problems of fisheries in terms of this life of the waters, just as we see the problem of any specific activity or product of the body in terms of the whole life of which it is an integral part. But we know next to nothing about this life of the waters. We have countless papers on isolated aspects or bits of aquatic life. But there is no knowledge and hardly an attempt to secure the knowledge of the life as a whole—as a "going concern," if I may change my figure. Still less is there any body of knowledge which enables us to place the production of fish—that essential source of food for us—in its proper place in the operation of that "going concern."
>
> . . . We must not be content with "conserving" our fisheries, though we admit with shame that we are not effecting even this beginning of our task. We too must aim to increase the product of the waters and we can do this only as aquiculture rests on a broad and firm foundation of organized knowledge—of science.
>
> We welcome, therefore, the Fairport Biological Laboratory not merely as a notable addition to the scientific resources of the country, but even more as embodying the promise of a new and advanced policy in dealing with the problems of aquiculture. I can express no higher wish for the laboratory and for the great interests served by it than that it may not only embody the promise but express the potency of that policy.

Professor Frank R. Lillie, representing the University of Chicago and the Marine Biological Laboratory of Woods Hole, Mass., having chosen for his theme "The Spirit of Cooperation in the Bureau of Fisheries" said in part:

> The cooperation that you here propose with the industries on the one hand and with the universities through their biologists on the other is a fine program which should be to the advantage of both parties. The relations which both will enter into with the government through this Bureau are among those close personal relations with our too impersonal government which contribute to the feeling that we are one people with one set of interests and a mutual loyalty.

After recalling the spirit of the founder of

[1] The quotations in this paper are by permission of the several speakers.

the Bureau of Fisheries, Professor Spencer Fullerton Baird, and the traditions that he established, he continued:

The universities are dedicated to the advancement of learning; the government naturally devotes itself to the promotion of the welfare of its citizens, but looks far ahead with the aid of science to avoid dangers and to create advantages for them. The disinterested pursuit of learning has so often led to great material gains that we have come to feel that all learning is worth while even from a material point of view. Pure and applied science, when compared, must exhibit angles of divergence, but these are not so broad as formerly, and the workers are cooperating more advantageously than ever before. There is an appreciation of the fact that the great material interests of mankind, the increase of health and the increase of wealth, depend to an increasing extent upon effective cooperation of pure and applied science. Neither can advance rapidly without the other. Together they will hasten the day of liberation from shackles of poverty and disease.

The Bureau of Fisheries bears the distinction of practising this cardinal principle of scientific progress from the day of its foundation. The dedication of this building is a reaffirmation of the strong belief and consistent practise of its wise founder.

Professor George Lefevre of the University of Missouri speaking on the subject "The Fisheries Biological Station in Relation to Universities," said in part as follows:

The history of the station thus far furnishes, among other things, a remarkable and unusual example of the carrying through to realization of a definite purpose, guided by a definite ideal and controlled by the scientific imagination. There has been no faltering on the way, no compromise of the ideal of service, until to-day we witness this inspiring fruition of a purpose consistently maintained and finally expressed in concrete form.

The aims and aspirations which the bureau had in mind for the Fairport Station were clearly expressed . . . at the beginning . . . in the following words: "This station is the first permanent fresh-water biological laboratory established by the government, and it is intended to become, not only the leading laboratory in America for the study of fresh-water biology, but one of the most important biological stations in the world."

It was a broad-minded and comprehensive policy of the Bureau for uniting both scientific and economic interests for mutual assistance and inspiration, and one that received the strongest endorsement and encouragement, on the one hand, by the universities, especially those of the middle west, and on the other hand by the pearl button industry.

With singular and striking harmony, essential agreement and understanding, and with unusual clearness of vision into the future, a federal bureau, an important industry, and educational institutions have worked together with a single purpose, for a definite end, and for a common good. Is not such a cooperation a heartening thing, and does not the existence of this station here to-day refute the contention of those apostles of individualism who belittle cooperative effort and maintain that all real progress in science springs from the researches of the isolated, independent laboratory worker?

. . . . . .

The station is, as has been pointed out by the bureau, quite analogous to the agricultural experiment station, and the service it can render to the development of the aquatic resources of the country is as important and fundamental as is that of the latter to the development of agricultural resources.

Professor C. C. Nutting brought greetings of the State University of Iowa and those of Leland Stanford Jr. University and its president emeritus, Dr. David Starr Jordan. Taking as his theme "The Biological Laboratory as an Aid to Pure Science," Professor Nutting discussed briefly the history of the Bureau of Fisheries, the ideals of Professor Baird and the relations existing in the past between the Bureau of Fisheries and the workers in the field of pure science. He concluded his address with the following question and its answers:

In answer to the question "How can the laboratory best serve as an aid to pure science?" I would say:

First. By proceeding in the future just as it has in the past; by laying a foundation of pure science by the work of the systematist and morphologist and then erecting a superstructure of applied science on this solid basis.

To illustrate just what I mean we have but to refer to the work on the fresh-water mussel. The

exploration of the more important mussel-bearing streams with a view to ascertaining the extent and number of the mussel beds—the source of supply—was done by men trained in the work of pure science. The material thus secured was carefully worked over, classified and described—the work of the systematist—which was embodied in an admirable report. Then Lefevre and Curtis undertook to work out the anatomy and embryology of the mussels of economic importance and to ascertain the species of fish best fitted to act as carriers of the mussel larvæ or glochidia. All of this was purely scientific work, and the results were embodied in a paper entitled "Reproduction and Artificial Propagation of the Fresh-water Mussels," to my mind an excellent piece of work from a purely scientific standpoint.

With this as a basis, the work of propagation of mussels, the infection of fish best suited to act as hosts to the glochidia and the proposing of laws regarding the mussel industry as a whole could be followed intelligently and effectively. And this, of course, is practical or "applied" zoology.

Second. This laboratory, being in operation through the year, in which it differs from most others in this country, studies of the life histories and ecology of fluviatile species can best be pursued here, and should, in my opinion, be distinctly encouraged. Graduate students from our colleges and universities could be detailed to do this work and thus contribute to pure science and at the same time lay the foundations for work of a distinctly economic bearing.

Third. Material secured here, such as protozoans, mussels, annelids and small crustaceans, could be sent to the biological laboratories of neighboring states and serve a valuable end in supplying such laboratories with many forms desired for class work in botany and zoology.

The raw material from which the scientists of the future must, in the main, be secured is found in the college students now in classes; and anything that aids in the preparation of these students for their future life work will ultimately be of prime importance not only to pure science but also to applied science and the welfare of mankind.

The conference on the morning of the 8th was presided over by Professor Stephen A. Forbes, professor of entomology, University of Illinois, and chief of the Natural History Survey of Illinois. The leading address, entitled "The Biological Resources of our Inland Waters" was presented by Professor James G. Needham, of Cornell University, who has epitomized his remarks in the following terms:

> Fish culture is a branch of animal husbandry. Animal husbandry makes progress about in proportion as it gives attention to the fundamental needs of animals, which are three: (1) Food, (2) Protection, and (3) Fit conditions for reproduction. Fish culture (as now practised) is not like other lines of animal husbandry because it gives adequate attention to only the last of these three. Further progress will lie in studying: (1) One species at a time, (2) One problem at a time, and (3) in one environment at a time. That is my creed for fish culture and for fish management and it applies to fish forage organisms and to fish enemies as well.

Several zoologists and business men participated in the general discussion relating to the subject of the conference.

The entire occasion was made agreeable and memorable through the generous cooperation of the National Association of Button Manufacturers, who gave luncheons at Fairport on the 7th and 8th and a banquet in Muscatine on the night of the 7th. The banquet in Muscatine was the occasion for a considerable number of extemporaneous talks by the various delegates present, and by persons representing the Station, the Bureau and the Department.

R. E. COKER

BRYOZOA AS FOOD FOR OTHER ANIMALS

BRYOZOA are common animals of the coastwise waters everywhere, but they have not been listed with any frequency in the food of other animals—in fact such references are exceedingly rare. It is of some interest, therefore, that I am able to record the fact that certain aquatic birds, at least occasionally, include them in their bill of fare.

Dr. E. W. Nelson, chief of the Bureau of Biological Survey, has recently sent me for determination a small collection of bryozoa taken from the stomachs of the king eider (*Somateria spectabilis*) and the Pacific eider (*Somateria v-nigra*). These ducks were taken

at the Pribilof Islands in the Bering Sea, and the presumption is that the bryozoa are from the same locality. The food records are as follows:

Crisia sp., from stomachs of the king eider and of two Pacific eiders, St. Paul I., Alaska, January 29 and 30, 1918.

Menipea pribilofi Robertson, from stomach of king eider, St. George I., Alaska, January 30, 1918.

Myriozoum subgracile d'Orbigny, from stomach of king eider, St. George I., Alaska, May 3, 1917.

Cellepora surcularis Packard, from stomachs of the Pacific eider, St. Paul I., Alaska, Mch. 21, 1915, and from the king eider, St. Paul I., Alaska, December 13, 1914 and January 29, 1918.

The amount of material in each case was small. The *Crisia* colonies were broken scraps and undeterminable as to species because of the lack of ovicells, though the general appearance was that of the common *C. denticulata* Lamarck. *Myriozoum subgracile* was represented by a branched portion 9 mm. long by 3 mm. thick, and *Cellepora surcularis* by irregular nodules 4 to 12 mm. in greatest diameter.

In all cases the animal matter seemed to have been digested out, leaving only the chitinous or calcareous matter of the ectocyst. Aside from the fact that they were considerably broken up, the specimens were in good condition for study, being as clean as though they had been treated with Javelle water. As Dr. Nelson suggests in a letter, it is probable that the ducks ate the *Crisia* and *Menipea* incidentally with other food, as these small branched species often grow attached to other organisms. The *Myriozoum* and *Cellepora* being nodular, may have been swallowed in lieu of pebbles.

In general the bryozoa must afford comparatively little nutriment, as the indigestible portion is so large, yet an animal pressed for food might be able to eke out an existence on them.

Certain fishes that habitually browse around ledges, rocks, wharves, etc., and which have teeth adapted for cutting off and crushing the shells of their prey, are known to include Bryozoa in their diet with some regularity. Thus, the cunner, *Tautogolabrus adspersus*, and the blackfish or tautog, *Tautoga onitis*, feed on bryozoa along with other hardshelled organisms. (See Sumner, Osburn and Cole, "Biological Survey of the Waters of Woods Hole and Vicinity," Bull. U. S. Bureau of Fisheries, Vol. XXXI., Part 2, 1911.) The kingfish, *Menticirrhus saxatilis*, also has been known to feed on bryozoa. The writer has observed *Bugula turrita* Desor and *Lepralia pallasiana* Moll among the stomach contents of the puffer or swellfish, *Spheroides maculatus*. On one occasion a couple of young puffers were placed over night in a finger bowl containing some colonies of the Endoproct, *Barentsia major* Hincks, and the next morning it was discovered that the puffers had returned my kindness in keeping them alive a few hours longer by eating the heads off of the most of the *Barentsia*. I have seen a considerable mass of *Bugula turrita* taken from the stomach of a smooth dogfish, *Mustelus canis*, and on several occasions have had referred to me for identification, nodules of *Smittina trispinosa nitida* Verrill and *Schizoporella unicornis* Johnston, from the stomachs of sharks. In one case the colony was half as large as my fist.

Bryozoa often grow in the greatest profusion, covering piles, rocks, shells, seaweed, etc., with growths so dense that they may entirely obscure the objects to which they are attached. At Woods Hole, Mass., during the summer of 1919, observations were made on *Bugula turrita*, growing on the rock wall of the Bureau of Fisheries dock, and on *Lepralia pallasiana*, encrusting the piles and timbers under the Coast Guard dock. Though in both cases the substratum was practically covered by the bryozoa and there were many other animals present, very few of the colonies showed injury of any sort. In nearly every case the colony form was perfect. It has been my experience in many years of dredging that

bryozoa colonies are usually complete, unless broken during dredging operations.

The bryozoan individual is always small, being rarely half as large as a pin head, but the colonial mass is often of sufficient size to render them desirable as food for numerous organisms, were it not for the fact that in nearly all cases they are well protected by heavy chitinous or calcareous walls. Only those animals provided with strong incisorial teeth or which can swallow the colony whole, can utilize them. Predaceous worms and other invertebrates probably are unable to feed on them to any extent, for in addition to its shell, the bryozoan is so highly irritable to tactile stimuli that it retracts into its shell with great rapidity at the slightest touch. Possibly some of the softer-bodied ctenostomes may serve as food for other invertebrates, but observations on this point are apparently lacking.

It should be added that the statoblasts of the freshwater bryozoa are often eaten by young fishes. During a survey of the fishes of Ohio, made during the past summer, statoblasts of *Pectinatella* and *Plumatella* were found among the stomach contents of the young of the large-mouth black bass, *Micropterus salmoides,* the crappie, *Pomoxis annularis,* the blue-gill sunfish, *Lepomis pallidus* and the gizzard shad, *Dorosoma cepedianum.* That these were picked up for food among other organisms of the same size there can be little doubt.

RAYMOND C. OSBURN
OHIO STATE UNIVERSITY

COPPER IN ANIMALS AND PLANTS

IN a recent number of *The Journal of Biological Chemistry* (Vol. 44, pp. 99–112, Oct., 1920) W. C. Rose and M. Bodansky report the finding of copper in various marine organisms, including Coelenterates, Mollusca, Crustacea, Elasmobranchs, and Teleostomi. As some of the writer's work bears on this subject, the following note is offered.

In some recent investigations on the respiration of insects the writer incinerated both the blood and entire specimens of over 30 species of insects, representing the chief orders. The ash was analyzed for copper, on the supposition that the copper present serves as the nucleus of a respiratory pigment, namely hemocyanin. In every case the ash reacted positively for copper with several reagents. The amount of copper present in insect blood is nearly proportionate to that present in crayfish blood, which was used as a control.

In addition to insects and crayfish, other Arthropods were incinerated, including several species of plankton Crustacea, spiders, daddy long-legs, and centipeds. In all cases copper was found. As representatives of other phyla *Volvox, Lumbricus, Ascaris,* snails and slugs, and the blood of garter snakes and human blood were incinerated. Of these all but the vertebrate blood reacted positively to tests for copper. As a matter of fact, the snake blood also appeared to show a minute trace of copper, but as the reaction developed with only one of the reagents used, and then only after several hours under alcohol vapor, this particular experiment is inconclusive.

The foregoing results indicate that the element copper has a wider distribution in living organisms than heretofore accepted. Its function has been definitely determined only for mollusks and Crustacea, where it forms the nucleus of a respiratory protein. Its presence in other Arthropods is explained on the same basis, that is, in all Arthropods copper forms the nucleus of hemocyanin. This is all the more probable, since, as already stated, the amounts present in insect blood, spiders and centipeds are proportionate to the amounts present in the crayfish blood used as a control.

In considering the source of the copper the writer analyzed the water of a creek from which most of his aquatic material was taken, and found distinct traces of the metal. The water as a source of copper is of importance to aquatic animals. It was shown, however, that terrestrial insects, including such highly specialized families as bees, ants and wasps, contained copper. These and other terrestrial insects, especially the herbivores, could derive

their copper only from their plant food. In view of this fact about a dozen species of plants were incinerated. In all cases, whether the portion incinerated was taken from the stem, or the leaves, or fruit, the ash reacted positively.

In general, copper was present only in traces in plants, not at all in amounts comparable to that present in insects. It is probable that the copper ion is inactive in plants, that its presence is due to mechanical storage, and that it plays no active rôle in the physiology of the plant.

It is evident, however, from the experiments performed, that copper is widely distributed in both the plant and animal world. In the former it is present only in traces, and probably inactive, while in the latter it is present in measurable quantities and its rôle appears to be active.

A more detailed account of these investigations will be published in the near future.

Richard A. Muttkowski
University of Idaho,
Moscow, Idaho

SCIENTIFIC EVENTS

DIRECTORS OF RESEARCH AND SCIENTIFIC QUALIFICATIONS

The Right Hon. F. D. Acland recently asked in the House of Commons, as we learn from *Nature*, whether the lord president of the council "is aware that dissatisfaction is being expressed by scientific workers with the appointment of a man without scientific qualifications as director of research to the Glass Research Association; whether, as the Department of Scientific and Industrial Research provides four fifths of the funds of the association, the department was consulted before the appointment was made; and does he approve of the appointment as giving a guarantee that state funds devoted to scientific research will be wisely expended?" Mr. Fisher replied to the question, and his answer included the following statements, which concerned a director for the work called from the United States: (1) The successful candidate has a wide and successful experience of scientific research into the problems of the glass industry, and is considered by the association to be the man best suited for organizing and directing the research needed by it. (2) The responsibility for the selection of a director of research rests in each case with the research association concerned, and not with the Department of Scientific and Industrial Research, which has no power to approve or disapprove the appointment of any individual. (3) The department guarantees three quarters of the expenditure of the research association up to a certain limit, but payment of the grant is conditional, among other things, on the approval by the department of the program of research and of the estimate of expenditure thereon. (4) The advisory council of the department, after considering all the relevant circumstances with great care, recommended the approval of the expenditure involved in this director's appointment.

ELECTIONS BY THE NATIONAL ACADEMY OF SCIENCES

The scientific program of the meeting of the National Academy of Sciences, held in Washington on April 25, 26 and 27, has been printed in Science, and other information concerning the meeting will be published later.

At the business session of April 27, the president of the academy, Dr. Charles D. Walcott, presented his resignation, but at the earnest request of the academy, he consented to serve the remaining two years of his term. The resignation of the foreign secretary, Dr. George E. Hale, was accepted with regret, and with the expression of high appreciation of his able work in that office. Dr. R. A. Millikan was elected foreign secretary, to complete the unexpired term of Dr. Hale. Dr. Hale was elected a member of the council, and Dr. Raymond Pearl was reelected.

The following were elected to membership:

Frank Michler Chapman, American Museum of Natural History.
William LeRoy Emmet, General Electric Company, Schenectady, N. Y.
William Draper Harkins, University of Chicago.
Ales Hrdlicka, United States National Museum.

Arthur Edwin Kennelly, Harvard University.
William George MacCallum, Johns Hopkins University.
Dayton Clarence Miller, Case School of Applied Science.
George Abram Miller, University of Illinois.
Benjamin Lincoln Robinson, Harvard University.
Vesto Melvin Slipher, Lowell Observatory.
Lewis Buckley Stillwell, 100 Broadway, New York.
Thomas Wayland Vaughan, United States Geological Survey.
Donald Dexter Van Slyke, Rockefeller Institute.
Henry Stephens Washington, Geophysical Laboratory.
Robert Sessions Woodworth, Columbia University.

Foreign Associates

William Bateson, John Innes Horticultural Institution, Merton Park, Surrey, England.
C. Eijkman, University of Utrecht, Holland.

THE PRINTERS' STRIKE AND THE PUBLICATION OF "SCIENCE"

SCIENCE has been issued weekly from the same press without intermission for over twenty-six years, but it is possible that the present number may be delayed. The widespread strike of compositors for a forty-four hour week affects the offices at Lancaster, Easton and Baltimore, in which a large part of the scientific journals of the United States are printed. The printing office will do all in its power to bring out the number at the regular time, and at present the pressmen are at work. In order to get the number through the press articles in type are being used with the exception of a few news notes. This unfortunately requires the postponement of the publication of accounts of the recent meetings of the National Academy of Sciences, the American Chemical Society, the Executive Committee of the American Association for the Advancement of Science, the Joint Committee on Conservation and other material of current interest. It may be noted that the advertisements are in type, and advertisers have been requested to continue to use the same copy, so that no sacrifice of reading matter is made for the advertisements. The number is, however, reduced by eight pages to facilitate its publication.

SCIENTIFIC NOTES AND NEWS

AT the recent meeting of the American Chemical Society at Rochester, Professor Charles F. Chandler and Dr. William H. Nichols were unanimously elected honorary members of the society.

DR. SIMON FLEXNER, director of the Rockefeller Institute for Medical Research, has been elected an honorary fellow of The Royal Society of Tropical Medicine and Hygiene of London at a meeting of the council of that society, held on April 8, 1921.

THE William H. Nichols medal of the New York section of the American Chemical Society was presented to Professor Gilbert M. Lewis, dean of the department of chemistry of the University of California on May 6. The program was: "The man and his work," remarks by Arthur B. Lamb, John Johnston; presentation of medal by John E. Teeple; acceptance and address, "Color and molecular structure," by Professor Lewis.

THE Royal Geographical Society of Great Britain, with the approval of the King, has awarded to Vilhjalmur Stefansson their Founder's Medal for his "distinguished services to the Dominion of Canada in the exploration of the Arctic ocean." The medal is to be presented at the anniversary meeting of the society in London on May 30. Mr. Stefansson will then be on a lecture tour in the western United States and consequently unable to attend, and it is expected that the High Commissioner for Canada will receive the medal on his behalf, as the Stefansson Arctic expedition of 1913–1918, of which this award is a recognition, was a Canadian naval expedition.

DR. STEPHEN SMITH, first president of the American Public Health Association, now ninety-eight years old, will welcome members of the association at the fiftieth annual meeting next November.

DON JOSÉ RODRIGUEZ CARRACIDO, rector of the University of Madrid, has been elected president of the Spanish Association for the Advancement of Science.

The meeting of the Academy of Sciences of Cuba on March 26 was a special session in honor of the return of Dr. Juan Guiteras from his mission to Africa to study yellow fever and other tropical diseases on behalf of the Rockefeller Foundation. It will be remembered that General Gorgas started with him, died in London.

Under the auspices of the Rockefeller Foundation Major-Gen. Sir Wilmot Herringham, consulting physician to St. Bartholomew's Hospital, vice-chancellor of the University of London, and Sir Walter Fletcher, senior demonstrator in physiology, Cambridge University, are traveling over the United States to study medical and scientific institutions for the British government.

The biological expedition to Spitzbergen, organized in Oxford University, is to set out in June, under the leadership of the Rev. F. C. R. Jourdain, and will devote its attention principally to ornithological work.

Professor Arthur H. Graves, collaborator, Office of Investigations in Forest Pathology, Bureau of Plant Industry, U. S. Department of Agriculture, and formerly assistant professor of botany in the Sheffield Scientific School and Yale School of Forestry, has accepted the appointment as curator of public instruction at the Brooklyn Botanic Garden to begin September 1, 1921.

Dr. R. A. Millikan, of the University of Chicago, delivered the first annual address before the Crowell Scientific Society of Trinity College, Durham, N. C., April 28. This society is a reorganization of the general scientific society which had been in existence for the past thirty years. Physicists and students from various parts of the state were in attendance.

Dr. David White, chief geologist of the United States Geological Survey, delivered a lecture on the "Deposition of oil shales and cannels," at the School of Mines of Pennsylvania State College on April 29.

Professor Albert Einstein, lectured at the University of Chicago on May 3, 4, and 5. The general subject of his lectures was "The Theory of Relativity."

William Robert Brooks, director of the Smith Observatory since 1888, and professor of astronomy at Hobart College since 1900, died at his home in Geneva, N. Y., on May 3, at the age of eighty-five years.

Dr. Albert C. Hale, formerly for twenty-nine years head teacher in the department of physical science at the Boys' High School, Brooklyn, secretary of the American Chemical Society for thirteen years, died on April 22 at the age of seventy-five years.

Captain E. W. Creak, C.B., F.R.S., formerly superintendent of compasses in the British Admiralty, died on April 3 at the age of eighty-four years.

UNIVERSITY AND EDUCATIONAL NEWS

The State Legislature of Texas passed an act which has now been approved by the governor appropriating one million, three hundred and fifty thousand dollars to be used in buying property adjacent to the present campus of the University of Texas. It is expected that about 120 acres, a considerable part of which is residence property, will be purchased.

Mrs. Ransohoff, the widow of Dr. Joseph Ransohoff, former professor of surgery at the medical college, has given $25,000 to the medical college of Cornell University toward an endowment fund for the establishment of a chair of surgery and anatomy. The money will be used as a nucleus for such an endowment, the minimum of which is estimated at $150,000.

Dr. Paul H. M.-P. Brinton, of the chemical department of the University of Arizona, has been appointed professor of analytical chemistry in the University of Minnesota.

Dr. R. W. Shufeldt has been elected professor in nature study in the summer school of the George Washington University.

Dr. John Edward Anderson, instructor in psychology at Yale University, has been promoted to an assistant professorship.

DISCUSSION AND CORRESPONDENCE

ENGLISH PRONUNCIATION FOR THE METRIC SYSTEM

DOUBTLESS practically all scientific workers favor general use of the decimal or metric system of weights and measures. Obviously there are certain unavoidable difficulties, both psychological and economic, which must be overcome before this end can be attained. It seems inconsistent, then, for users of the system to add unnecessarily, even in small degree, to the popular prejudice against the change.

Just such an unnecessary minor difficulty is produced by a common American practise in the pronunciation of metric names containing the prefix *cent-*. As a matter of history, it is true, these names came to us from the French; they could just as well, however, have been taken directly into English from the Latin and Greek. In most respects these words are already, by common consent, fully Anglicized; we never employ the French syllabic stress, nor do we use the French sound of the *r* or the *i* or the second *e* in *centimeter*. Why, then, should we ever say "sänt" (sahnt), approximating the sound in *centime*, for the straightforward English "sĕnt" (as in *center*)? Although this hybrid pronunciation is (for example) not recognized by the Funk and Wagnalls "New Standard Dictionary," it is certainly widely prevalent in this country, and it doubtless adds a little to the unthinking popular prejudice against the metric system as a "high-brow" foreign innovation. The same considerations apply to the word *centigrade*, which has come into English by the same route.

In various other English words, such as *cental, centipede,* and *centenary, cent* is regularly pronounced as in the case of the name of our monetary unit. The only excuse for a different practise for the metric system is the fact that these words were first used by the French. They are truly international words, however, and as a matter of practical convenience they should be naturalized in each language in which they are used. Any attempt at precise international uniformity for such words is obviously predestined to failure, except as this uniformity comes with the general adoption of an international auxiliary language such as Esperanto—and even when this happens the usage of "national" languages will probably remain unchanged.

And while we are about it, in conformity with the definite trend of modern English usage, can we not all agree to drop the "me" from *gram(me)*, and to write *meter* rather than *metre*?

HOWARD B. FROST
CITRUS EXPERIMENT STATION,
RIVERSIDE, CALIFORNIA

EXTRAMUNDANE LIFE

TO THE EDITOR OF SCIENCE: In SCIENCE for March fourth an eminent astronomer speaks of the "strong probability that intelligent life exists in abundance throughout the universe." May I inquire where I can secure any *evidence* in support of this statement? I should like to know upon what grounds I may assert that life exists anywhere but upon this earth. Secondly, how may I know it is intelligent? And thirdly, how may I know that it exists in abundance? The whole assertion savors to me of newspaper pseudo-science.

HUBERT LYMAN CLARK
WILLIAMSTOWN, MASS.,
April 11

TO THE EDITOR OF SCIENCE: On April 4 I had the pleasure of suggesting by letter directly to Professor Hubert Lyman Clark that he read Professor Simon Newcomb's superb essay of thirteen printed pages on this very old subject, entitled "Life in the Universe," and contained in his volume, "Side-Lights on Astronomy" (Harper and Brothers), pp. 120–132, 1906. One of Newcomb's concluding sentences (p. 132) reads, "It is, therefore, perfectly reasonable to suppose that beings, not only animated, but endowed with reason, inhabit countless worlds in space."

W. W. CAMPBELL
MOUNT HAMILTON, CALIFORNIA,
April 25

SCIENTIFIC BOOKS

The Sumario Compendioso of Brother Juan Diez. The earliest mathematical work of the New World. By David Eugene Smith. 1921. Boston and London: Ginn and Company. 65 pages. Price $4.00.

Those who are interested in the earlier mathematical developments only in so far as it can be shown that these developments have contributed directly to the present extent of our mathematical knowledge will find little to interest them in the present small volume. It is not claimed that this volume exhibits any decided step forward in mathematics or that it exerted a great influence on later works devoted to the same subject. There are, however, many mathematicians and historians who will doubtless be very glad to have an opportunity to read in their own language the excellent translation which Professor Smith has here provided of what seems to be "the earliest mathematical work of the New World."

It is desirable that the student of the history of arithmetic should be able to consult original sources. By the publication of the "Rara Arithmetica" about a dozen years ago and by the publication of the present volume Professor Smith has rendered very valuable service to those who desire to consult such sources. The historical notes which appear in these works are exceedingly valuable even if they are often less extended than might appear desirable. In the present volume two pages or less of such notes relate to each of the following four subjects: The Mexico of the period, printing established in Mexico, general description of the book, and nature of the tables.

An important oversight should be noted here in order that the reader may not be misled in regard to the time when the book under review, which was first published in 1556, became known to American educators. To establish the fact that the reader is seriously exposed to misconception as regards the point in question and also on account of the interest which these statements may command, we quote the first three sentences of the preface.

> If the student of the history of education were asked to name the earliest work on mathematics published by an American press, he might, after a little investigation, mention the anonymous arithmetic that was printed in Boston in the year 1729. It is now known that this was the work of that Isaac Greenwood who held for some years the chair of mathematics in what was then Harvard College. If he should search the records still farther back, he might come upon the American reprint of Hodder's well-known English arithmetic, the first text-book on the subject, so far as known, to appear in our language on this side the Atlantic.

As some "student of the history of education" may be assumed to have read the "Rara Arithmetica" and noted that on page 286 thereof the work under review was called "the first arithmetic printed in America" it seems strange that such a student should have been overlooked while the said preface was written. One is perhaps still more surprised to find that such an intelligent student was also overlooked when Professor Smith prepared the article relating to the book under review for the last January number of the *American Mathematical Monthly* as well as when he read a paper before an intelligent audience during the recent meeting of the American Association for the Advancement of Science at Chicago. On both of these occasions the substance of the part of the preface quoted above was given without any reference to the fact that one of the most interesting elements relating to the subject under consideration had been noted a dozen years earlier in the "Rara Arithmetica."

The emphasis on this oversight in such a public place seems to be justified by the facts that this emphasis may tend to lessen the danger that readers of the book under review will be misled as regards an interesting historical fact, and that one could not condemn in too strong terms one of the motives which might possibly be ascribed to the translator and editor by the reader after discovering that he had been misled by the statements quoted above. Being forewarned such a reader is more likely to attribute these statements to an astounding oversight by an unusually painstaking and careful writer.

Tables make up the greater part of the original work but as they are no longer of

any importance only one page is shown in facsimile in the present edition. The rest of the text is reproduced on the left hand pages while the translation appears on the following pages. The last six pages are devoted to algebra, chiefly relating to quadratic equations, and, in closing, the author states that he "wished to set down the things which are necessary and familiar in this kingdom." The formula near the bottom of page 37 is not clearly stated. Professor Smith's name is a sufficient guarantee that the work is in an attractive form.

G. A. MILLER
UNIVERSITY OF ILLINOIS

Introduction à l'étude pétrographique des roches sédimentaires. Par M. LUCIEN CAYEUX. Mémoires pour servir à l'explication de la carte géologique détaillée de la France. Paris: Imprimerie Nationale 1916. Quarto, 1 vol. text, pp. viii + 524, 80 figures; 1 vol. LVI plates.

It is a curious fact that although Sorby, the father of modern petrography, was especially interested in sedimentary rocks, those who followed him, with the exception of a small but persistent succession of workers in his own country, almost abandoned them in favor of the igneous rocks. The author of the book under review has elsewhere suggested that this was perhaps due to the lure of greater mystery in the igneous rocks and to the lack of knowledge, before the *Challenger* expedition, about the sediments of today. The reviewer has always been inclined to attribute the preference for the study of igneous rocks to their greater and more obvious diversity, which made it easier to find something new in them and gave them a greater esthetic attractiveness. Whatever the cause the present work will be the most powerful influence that has yet been brought to bear in changing that tendency. Indeed, in French-speaking countries Cayeux's influence is already very manifest. If the beauty of the sedimentary rocks has been considered inferior the enthusiasm of the author will surely correct that impression.

The work marks an epoch in its field and is written with a breadth of view worthy of the fundamental importance of the sedimentary rocks in the interpretation of the history of the earth. The author not only stands alone in the extent and thoroughness of his monographic investigations in this field, but as the successor of Élie de Beaumont, Fouqué and Michel-Lévy at the Collège de France he is, so far as the reviewer knows, the only person occupying a chair devoted entirely to the teaching of the petrology of sedimentary rocks. On his inauguration the name of the chair he occupies was changed from "Chair of the Natural History of Inorganic Bodies," to "Chair of Geology," but it might well have retained its old name, for as he says in his inaugural address, "The science of the sedimentary rocks is and will remain for us *a natural history of the ancient and modern sediments.*" It is the treatment from this point of view and the enthusiasm and wide personal experience which the author brings to it that gives to a book which one might expect to find dry and technical a freshness, interest, and charm that make it fascinating reading. Furthermore, the book is so full of original observations drawn from the writer's many years of study that no student of sedimentary rocks, be he petrographer or merely stratigrapher, can afford to leave it unread.

The work is divided into two parts. The first deals with methods of analysis of sedimentary rocks, the second with the diagnostic characters of the constituents, which fall into two groups—the minerals and the remains of organisms.

The first part is refreshingly free from pedantry or love of technique as an end in itself, though the artist's pleasure in some refined and delicate method often finds expression. Methods of handling rocks of different types according to their induration or susceptibility to attack by acid are discussed, but the possible complexity of the procedure appropriate to any individual rock and the need of adapting the methods used to the particular rock and to the object of the investigation are pointed out. Quantita-

tive results are sought, but the difficulties of obtaining them are recognized and the usefulness of quantitatively expressed results that may not be accurate in themselves but still may permit of valuable comparison with one another, is admitted. The reader feels throughout no impulse on the part of the author to fix standards but merely that desire to give help, out of his own rich but painfully accumulated experience, which led him to prepare the book. Any one who comes to this book for a rigorous method that will enable him to turn out orthodox studies of sedimentary rocks will be disappointed, but those who want to help in advancing the borders of knowledge about this subject will find guidance and inspiration. The methods of analysis are grouped under three heads—physical, microchemical and chromatic. The physical analysis includes different processes sometimes grouped in this country under mechanical analysis, and the preparation of thin sections which in dealing with weakly bound sedimentary rocks often calls for special methods. The demonstration of the ease of application and delicacy of microchemical analyses is one of the outstanding features of the book. Under chromatic analysis the author discusses various methods of staining. In the discussion of all these methods he selects, weighs, evaluates and contributes on the basis of his own experience, without attempting any formal completeness.

Perhap Cayeux's greatest achievement is the interest he is able to give to his discussion of the minerals of sedimentary rocks, of which of course he considers only the more common, both essential and accessory. It is in this part of the book that his treatment of the subject as natural history is illustrated in the most novel and interesting way. The individual mineral is to the author a record of environments—of the environment in which it originated and of those through which it subsequently passed—and it therefore contributes to the reconstruction of the history and geography of the past.

The last part of the book deals with the remains of organisms as constituents of the rocks. Needless to say, specific determinations of organisms are not the purpose of a treatise on petrography. But here, too, the problem of past environment as recorded by the remains, both as remnants of once living organisms and as mineral substances, is the object of study. This part therefore deserves the attention of paleontologists as well as of petrographers and stratigraphers.

Vivified throughout by the author's own experience the work must lack that perfect completeness that would assure it against being found defective in the treatment of some special topics or methods that may be in favor with individual readers. But every reader will surely be glad to accept these omissions for the sake of the vigor and readibility that go with them. American petrographers, for instance, will be struck by the absence of any discussion of the use of liquids of known indices of refraction in the determination of minerals. But as compensation they may profit by adopting some of the elegant microchemical tests described, which have the advantage that they can often be applied directly to the thin section and do not require the disintegration of the rock. Likewise the suggestions given on pages 305 to 309 for the determination of minerals by their general appearance may be a valuable antidote to the habit into which the devotee of "index liquids" is likely to fall, of resorting to his liquids in blind routine, just as the man with the slide rule habit gets out his machine to find the product of 2×2.

The physical quality of the book is worthy of its subject matter, and it is a fact for contemplation and an honor to the fine French scientific spirit, exemplified by the entire work, that it bears the date 1916.

Marcus I. Goldman
U. S. Geological Survey

SPECIAL ARTICLES

NOTES ON THE OCCURRENCE OF GAMMERUS LIMNAEUS SMITH IN A SALINE HABITAT

The capacities of various organisms for withstanding relatively wide ranges of environmental conditions has received considerable

attention at the hands of physiologists and students of animal behavior, and is a problem which must ultimately be considered in greater detail by ecologists, students of geographic distribution and organic evolution.

The purpose of this note is merely to call attention to the occurrence of *Gammerus limnaeus* Smith,[1] normally a fresh water[2] species, in a peculiar and rather saline habitat.[3]

In the summer of 1920 the writers visited the Ice Spring Craters lava field of the Sevier Desert in the ancient Lake Bonneville basin described in detail by Gilbert.[4] On climbing down into the old lava vent[5] of the Terrace crater we were surprised to find a small crustacean abundant in the small pool of clear water at the bottom. It was noted that a number of the animals were very slightly pigmented, apparently indicating that in the semi-darkness of the pool they were approaching cave conditions. In all instances, however, the eyes were fully pigmented. The presence of the *Gammerus* led to the assumption that the water was non-saline and we were preparing to replenish our water bag when taste showed it to be distinctly brackish.

A sample of the water was therefore taken in a clean Mason fruit jar from which it was afterwards transferred to citrate bottles for shipment to the laboratory. The water had a freezing point lowering of 0.410° C., indicating an osmotic concentration of 4.94 atmospheres and an electrical conductivity of .0138 reciprocal ohm. The hydrogen ion concentration of the water (determined electrometrically) was $C_H = 0.409 \times 10^{-7} = p^H 7.388$. Analysis showed the following composition.

	Grams per Liter
Total solids (at 110°)..	8.5666
Total solids (at 210°)..	8.1467
Total solids (ignited)[6]..	7.6400
CO_3[7]	none
HCO_3[7]	0.2187

Mineral Analysis

	Grams per Liter	Per Cent. of Total Solids (Ignited)
SiO_2	0.0720	0.94
$Fe_2O_3Al_2O_3$	0.0030	0.04
Ca	0.3305	4.33
Mg	0.2560	3.35
Na	1.9750	25.85
K	0.3050	3.99
Cl	3.4120	44.66
SO_4	1.3260	17.36
CO_3[8]	0.1075	1.41
Total	7.7870	101.93

[1] We are indebted to Mr. Waldo L. Schmitt, associate curator of marine invertebrates in the U. S. National Museum, for the determination of the species. The specimens are in the National Museum.

[2] The key to the taxonomic and distributional literature is furnished by Weckel's paper on the fresh water Amphiopoda of North America (*Proc. U. S. Nat. Mus.*, 32: 42–44, 1907), and individual citations need not be given here. The species was first dredged in Lake Superior. It has been taken near Long's Peak, Colorado, at an elevation of 9,000 feet; from a cool spring, Fire Hole Basin; from Shoshone Falls, Idaho; Flathead Lake, Montana; and from the Yellowstone National Park. It is reported from Fort Wingate, N. M., and from the Wasatch Mountains and Salt Lake City, Utah. It is impossible to determine from the records whether all the localities were fresh water habitats, but that it is typically a fresh water form can admit of no possible doubt. It has been taken from the stomachs of trout from brooks near Marquette, Mich.

[3] The genus *Gammerus* has species which occur in more or less saline coastal habitats and in non-saline inland waters.

[4] Gilbert, G. K., "Survey West of the 100th Meridian," Vol. 3, pp. 136–144; also "Lake Bonneville," Monographs U. S. Geol. Survey, I., pp. 320–325, 1890.

[5] The lava vent is a circular tube, at one side of the wide crater, about 12 feet in diameter inclined 10° or 15° from the vertical. It can be explored for about 25 feet when progress is stopped by water.

[6] There was apparently considerable organic matter in solution. This could easily be derived from bat guano which was observed on the lava ledges surrounding the pool.

[7] Carbonates and bicarbonates were determined by the titrametric method proposed by Scales (SCIENCE, N. S., 51, p. 214, 1920).

[8] Calculated from bicarbonate data according to the formula $2RHCO_3 + \text{heat} = R_2CO_3 + CO_2 + H_2O$.

Hypothetical Inorganic Composition of the Solution

	Grams per Liter	Per Cent. of Total
Na_2SiO_3	0.1460	1.84
$Ca(HCO_3)_2$	0.2913	3.68
$CaSO_4$	0.8780	11.08
$MgSO_4$	0.8855	11.18
$MgCl_2$	0.3023	3.81
KCl	0.5875	7.42
NaCl[9]	4.8330	60.99
Total	7.9236	100.00

The Terrace crater, and indeed all of the craters of the Ice Spring Craters group, is unquestionably post-Bonneville in origin. There is no trace of wave work on the outer slopes of the craters such as are so conspicuous on Pavant Butte to the north, and neither lacustrine sediments nor evidences of subaqueous erosion appear on the surface of the evidently recent lava fields as they do on the Fumarole Butte lava field to the northwest.

The depth of the vent of the Terrace crater is 260 feet below its general rim and 220 feet below the sill of the last outflow. The problem of the original introduction of *Gammerus* into the small pool of water occupying the bottom of this crater is that of the transportation of small crustacean species or their eggs in general. The point of physiological interest is the occurrence of this species, hitherto reported from non-saline waters, in water of this concentration.

Ross Aiken Gortner,
Division of Agricultural Biochemistry, University of Minnesota,
J. Arthur Harris,
Station for Experimental Evolution, Carnegie Institution of Washington

[9] An average value based on NaCl contents of 4.8790 gr. calculated from residual Na and 4.7870 calculated from residual Cl. The difference of 0.092 gram per liter is within experimental error when one remembers that the above calculations are purely empirical and also when one considers that in some instances the actual analytical values, and consequently accompanying experimental errors, were multiplied by 50 to bring the calculation to a liter basis.

AN EYELESS DAPHNID, WITH REMARKS ON THE POSSIBLE ORIGIN OF EYELESS CAVE ANIMALS

During the past nine years vast numbers of Cladocera of several species have been reared in the writer's laboratory. For one purpose or another many thousands of these have been examined with the microscope. About a year ago was found the only marked aberration of the eye structure which has been noted. This was a *Simocephalus* without any trace of an eye.

Unfortunately this individual was discovered among the small number just killed for use in making some permanent slide mounts. The killing of this individual was unfortunate in that a Cladoceran when killed becomes somewhat opaque while the live animal is so transparent that internal structures can be clearly distinguished. Nor was the differentiation so good in the completed mount as in a live animal. It was clear however both in the freshly killed specimen and in the mount that not only the eye pigment but the entire eye structure was lacking. The ocellus was present and normally pigmented. While it is not quite demonstrated in the mounted specimen it is probable that the optic ganglion is normally developed in the eyeless individual.

It is a source of keen regret to the writer that this eyeless individual was not discovered alive so that offspring could have been obtained from it and light thrown on the nature of the peculiarity, whether of genetic consequence or merely an accident in development. No eyeless individuals were found among sibs and many offspring of sibs of this eyeless individual. This fact however does not convince one that eyelessness in this case may not have been inheritable, since in these prevailing parthenogenetic forms there is no chromatic reduction in the maturation of the egg and hence no segregation of characters is expected. If the eyeless condition of this individual were due to a mutation its descendants should have been eyeless, but un-

less the mutation occurred in a cell generation earlier than that in which the egg itself was differentiated no other germ cells of the parent or collaterals of the eyeless individual should bear the factor for eyelessness.

Observation of the occurrence of an eyeless mutant and the transmission of this characteristic would be of great interest as bearing upon the probable origin of eyeless cave animals. As is well known, many cave animals, particularly crustaceans, are without eyes or have extremely degenerate eyes.

It has been suggested that such cave forms may have arisen by "orthogenesis" (many small mutations) or, by implication, possibly by a single large mutation.[1]

Eyelessness in these forms is associated with lack of body pigment. Pigmentless animals, such as cave amphipods for example, may suffer deleterious effects if they come under the influence of the actinic rays of sunlight. Such animals are conspicuous and an easy prey to their natural enemies. In so far as a general vision may aid such organisms in reaching a suitable locality for securing food eyeless individuals are at a disadvantage in the open in competition with eyed individuals. On the other hand in caves and similar situations they are shielded from light, are not rendered conspicuous by their whiteness and are at no disadvantage in competition for food. It would seem that they have become segregated in caves and other retired situations because they can survive there and are unable to do so elsewhere.

The occurrence in *Drosophila* of a "bar-eyed" mutant (eye much reduced in size and in effective elements) and an "eyeless" mutant (in most cases not really eyeless but eyes more or less rudimentary) lends credence to the theory that eyeless cave animals, or such animals with very defective eyes, may have arisen as the result of mutations. One does not however lose sight of the fact that the eyeless daphnid mentioned may have arisen from a disturbance in development such as the writer has seen in eyeless salamander larvae and as have been found in other experimentally treated material. Of course in such cases one does not in general (Guyer's rabbits possibly form a notable exception) anticipate any degree of inheritance whatever, even if the abnormal individuals were viable and capable of producing young.

In the case of this eyeless daphnid however there were embryos in the brood chamber and there seemed every reason to believe that it possessed the normal capacity for producing young.

ARTHUR M. BANTA

[1] Banta, Carnegie Institution of Washington, Publication No. 67, 1907.

THE EASTER MEETING OF THE AMERICAN MATHEMATICAL SOCIETY AT CHICAGO

THE sixteenth regular Western meeting of the American Mathematical Society was held at the University of Chicago on Friday and Saturday, March 25 and 26, 1921. The meetings were attended by over sixty persons, among whom were fifty-three members of the society.

The session of Friday afternoon was devoted to a lecture by Professor Dunham Jackson on "The general theory of approximation by polynomials and trigonometric sums."

It was voted at this meeting that the Christmas meeting of the Chicago Section be held in Toronto, in affiliation with the Convocation week meetings of the American Association for the Advancement of Science.

A dinner at which forty-seven persons were present was held at the Quadrangle Club on Friday evening.

At the sessions of Friday and Saturday forenoons, the following papers were presented:

1. I. J. Schwatt, "On the expansion of powers of trigonometric functions."
2. I. J. Schwatt, "On the summation of a trigonometric power series."
3. W. B. Ford, "A disputed point regarding the nature of the continuum."
4. Mayme I. Logsdon, "The equivalence of pairs of hermitian forms."
5. C. C. MacDuffee, "Invariants and vector covariants of linear algebras without the associative law."
6. E. J. Wilczynski, "Some projective generalizations of geodesics."
7. W. L. Hart, "Summable infinite determinants."

8. H. Blumberg, "New properties of all functions."
9. E. B. Van Vleck, "On non-loxodromic substitution groups in n dimensions."
10. G. A. Miller, "An overlooked infinite system of groups of order pq^2, p and q being prime numbers."
11. L. E. Dickson, "Fallacies and misconceptions in diophantine analysis."
12. L. E. Dickson, "A new method in diophantine analysis."
13. T. H. Hildebrandt, "On a general theory of functions—preliminary communication."
14. A. Dresden, "Some new formulæ in combinatory analysis."
15. J. B. Shaw, "Generational definition of linear associative hypernumbers."
16. J. B. Shaw, "On Hamiltonian products—Second paper."
17. F. E. Wood, "Congruences characterized by certain coincidences."
18. E. P. Lane, "A general theory of congruences."
19. J. Eiesland, "The group of motions of an Einstein space."

Professor Schwatt's papers were presented by Professor Dunham Jackson; Mr. MacDuffee was introduced to the society by Professor L. E. Dickson and Professor Wood by Professor Wilczynski; the papers of Professors Miller and Lane were read by title. Professor Bliss, president of the society, presided at the meeting of Friday afternoon. The other sessions were presided over by Professor R. D. Carmichael, chairman of the Chicago Section, relieved on Saturday by Professor Dunham Jackson, vice-president of the society.

Arnold Dresden,
Secretary of the Chicago Section

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PACIFIC DIVISION

1. REPORT OF THE SECRETARY-TREASURER FOR THE CALENDAR YEAR ENDING DECEMBER 31, 1920

January 1, 1920, Cash balance.....		$524.72
Receipts		
Received from the Permanent Secretary's office	$1,764.00	
Affiliated societies	115.00	
Dues and fees	272.00	$2,151.00
		$2,675.72
Expenditures		
Dues remitted to Permanent Secretary's office	$141.00	
Supplies	18.00	
Salary, 1920	825.00	
Salary, 1919	75.00	
Office assistance	300.00	
Postage and express	37.67	
Telephone and telegraph	8.20	
Expense, general	5.40	
Expense, travel	208.50	
Printing	133.40	
Membership campaign	76.25	$1,828.42
January 1, 1921, Cash balance.....		$847.30

2. BALANCE SHEET, DECEMBER 31, 1920

Assets	
Equipment	$235.73
Cash on hand	847.30
	$1,083.03
Liabilities	
Permanent Secretary's office	$747.30
Investment (equipment)	235.73
Sundry creditors account	100.00
	$1,083.03

3. SUMMARY OF ANNUAL DISBURSEMENTS FOR THE YEAR 1920

Supplies	$18.00	
Salary	900.00	
Office assistance	300.00	
Postage and express	37.67	
Telephone and telegraph	8.20	
Expense, general	5.40	
Expense, travel	208.50	
Printing	133.40	
Membership campaign	76.25	$1,687.42
These disbursements have been made from funds derived as follows:		
Affiliated societies (assessments)	115.00	
Initiation fees	163.00	
Receipts from the Permanent Secretary's office	1,409.42	$1,687.42

W. W. Sargeant,
Secretary, Pacific Division